

Notice of Allowability	Application No.	Applicant(s)	
	10/726,238	FEIWEIER, THORSTEN	
	Examiner	Art Unit	
	Tiffany A. Fetzner	2859	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 12/20/2005 & the telephonic interview of 1/04/2006.
2. ☒ The allowed claim(s) is/are 1-19.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☒ to Paper No./Mail Date 10/12/2005.
 - (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 01/06/2006.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____ 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | <ol style="list-style-type: none"> 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date <u>01/06/2009</u>. 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance 9. <input type="checkbox"/> Other _____. |
|--|--|

Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.
2. Authorization for this examiner's amendment was given in a telephone interview with **Attorney Steven H. Noll Reg. No. 28,982** on January 4th 2006 along with authorization to charge any necessary fees to applicant's deposit account. No fees are believed to be due at this time because applicant's not-entered after final amendment was received less than 3 months after the final office action of October 17th 2005.
3. The application has been amended as follows:

A) Replace claim 1 of the claims submitted August 4th 2005, with the following
Examiner amended claim 1:

Claim 1 --- A method for determining a field strength of radio-frequency energy emitted during a magnetic resonance measurement, comprising the steps of:

from an antenna of a magnetic resonance examination apparatus, emitting at least one radio-frequency pulse from said antenna to generate an antenna-emitted radio-frequency field having a field strength, and thereby causing an examination subject in said radio-frequency field to emit a magnetic resonance signal;

receiving said magnetic resonance signal;

determining a phase of said **received** magnetic resonance signal; and,

from said **determined** phase, determining said field strength, of said antenna-emitted radio-frequency field. ---

B) Replace claim 2 of the claims submitted August 4th 2005, with the following
Examiner amended claim 2:

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Claim 2 --- A method as claimed in **claim 1** comprising
said magnetic resonance signal in said subject in a spatially resolved manner within a measurement volume;
determining, **as said determined phase**, a spatially-dependent phase of the **received** magnetic resonance signal; and
determining **said** field strength as a function of a location within said measurement volume. ---

C) Replace claim 3 of the claims submitted August 4th 2005, with the following
Examiner amended claim 3:

Claim 3 --- A method as claimed in **claim 1** comprising
receiving said magnetic resonance signal in said subject in a spatially resolved manner within a measurement volume;
determining, **as said determined phase**, a spatially-dependent phase of the **received** magnetic resonance signal; and
determining **said** field strength as a function of a location within said measurement volume. ---

D) Replace claim 4 of the claims submitted August 4th 2005, with the following
Examiner amended claim 4:

Claim 4 --- A method as claimed in **claim 1** wherein
said at least one radio-frequency pulse produces a flip angle of nuclear spins in said subject, and comprising determining said flip angle from said **determined** phase and determining said field strength dependent on said flip angle. ---

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E) Replace claim 8 of the claims submitted August 4th 2005, with the following
Examiner amended claim 8:

Claim 8 --- A method as claimed in **claim 1** comprising
receiving said a magnetic resonance signal, **as said received magnetic resonance signal in a plurality of** respectively separate measurements and, for each measurement, determining the phase of the **received** magnetic resonance signal, and
determining a phase difference between the respective phases from two of said **plurality of** measurements and determining said field strength dependent on said **determined** phase difference. ---

F) Replace claim 13 of the claims submitted August 4th 2005, with the following
Examiner amended claim 13:

Claim 13 --- A method as claimed in **claim 1** wherein the step of determining said field strength comprises
determining a spatially-dependent field strength for a group of adjacent voxels by identifying the phase of respective **received** magnetic resonance signals for individual voxels in said group and combining the respective phases into a common phase, and
determining the strength for said voxel group from said common phase. ---

J) Replace claim 14 of the claims submitted August 4th 2005, with the following
Examiner amended claim 14:

Claim 14 --- A method as claimed in **claim 13** wherein each of the **received** magnetic resonance signals for the individual voxels has an amplitude, and comprising weighting the **determined** phase dependent on the amplitude of the associated **received** magnetic resonance signal. ---

K) Replace claim 15 of the claims submitted August 4th 2005, with the following
Examiner amended claim 15:

Claim 15 --- A method as claimed in **claim 1** wherein the step of determining said field strength comprises

determining a spatially-dependent field strength for a group of adjacent voxels by identifying the phase difference of respective **received** magnetic resonance signals for individual voxels in said group and combining the respective phase differences into a common phase difference, and

determining the field strength for said voxel group from said common phase difference. ---

L) Replace claim 16 of the claims submitted August 4th 2005, with the following
Examiner amended claim 16:

Claim 16 --- A method as claimed in **claim 15** wherein each of the **received** magnetic resonance signals for the individual voxels has an amplitude, and comprising weighting the phase difference dependent on the amplitude of the associated **received** magnetic resonance signal. ---

N) Replace claim 18 of the claims submitted August 4th 2005, with the following
Examiner amended claim 18:

Claim 18 --- A magnetic resonance examination apparatus comprising:

a magnetic resonance scanner **configured** to receive a subject therein, said magnetic resonance scanner having a radio-frequency antenna;

a control computer **that operates** said magnetic resonance scanner, including operating said radio-frequency antenna; and

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said control computer operating said magnetic resonance scanner and said radio-frequency antenna to emit at least one radio-frequency pulse from said radio-frequency antenna **in order** to generate an antenna-emitted radio-frequency field having a field strength, and thereby exciting a magnetic resonance signal from said subject, **and in order to acquire** said **excited** magnetic resonance signal, said control computer determining a phase of said **acquired** magnetic resonance signal, and determining said field strength of said antenna-emitted radio-frequency field from said **determined** phase. ---

O) **Replace claim 19** of the claims submitted August 4th 2005, with the following **Examiner amended claim 19**:

Claim 19 --- A computer **readable medium encoded with a computer program** loadable into a control computer of a magnetic resonance examination apparatus having a radio-frequency antenna operated by said control computer, said computer program running in said control computer and causing said control computer to:

operate said antenna to emit at least one radio-frequency pulse from said radio-frequency antenna **in order to generate an antenna-emitted radio-frequency field having a field strength**, and thereby exciting a magnetic resonance signal in a subject in said field;

acquire said magnetic resonance signal; and

determine a phase of said **acquired** magnetic resonance signal and determine said field strength of said antenna-emitted radio-frequency field from said **determined** phase. ---

The following is an examiner's statement of **Reasons for Allowance**:

4. With respect to **Examiner amended claims 1-4, 6-8, and 12-19 above**; as well as **claims 5 and 9-11** from the claims submitted August 4th 2005, which remain as

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presented therein. Each of these claims considered to be allowable over the **prior art of record** because the **prior art of record** does not disclose or suggest an MRI apparatus/method comprising the limitation of "determining a field strength of radio-frequency energy emitted during a magnetic resonance measurement" and in summarization form: the limitations of the determined phase of the received / acquired MR signal itself is utilized in determining the field strength of the antenna-emitted radio-frequency field which emitted the RF pulse and caused the examination subject within the radio-frequency field to emit the received/ acquired magnetic resonance signal originally. [See the **examiner amended claims 1, 18, and 19 above.**] **It is the combination of the claim limitations taken as a whole that constitutes both the novelty and non-obviousness of applicant's claims.**

5. With respect to **Mueller et al.**, US Patent Application Publication 2003/0078941 A1 issued April 24th 2003, filed September 27th 2002 The examiner notes that this reference does determine the phase of an emitted RF signal, with a separate directional coupler, which in turn is used to determine the strength of the RF emitting field. The emitted RF signal that is utilized is not an MR imaging signal resulting from the emitted RF signal, which caused an Rf excitation within an examination subject. The RF phase determination of **Mueller et al.**, is separate from, and auxiliary to, magnetic resonance imaging and MR signal detection from an examined subject that is ongoing in the reference. The **Mueller et al.**, reference does not apply the applicant's novel feature of determining the strength of the emitted RF field by using the phase of the actually received / detected MR signal from the examination subject. (i.e. in applicant's invention the separate directional coupler component is not needed.) Applicant's novelty is that the phase of the detected MR signal, which is emitted from a patient, in response to a magnetic field strength RF pulse, emitted by an RF antenna, and applied to examination subject, is utilized to determine the previously unknown magnetic field strength RF pulse that was actually applied by the RF antenna to the examination subject. Therefore the **Mueller et al.**, reference fails to teach the novelty of applicant's examiner amended independent claims.

6. Each of the **dependent claims 2-17** above are considered to be allowable over the prior art by the examiner because they each depend from an allowable examiner amended independent claim.

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Examiner's Comment
Priority

8. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

9. As per the PTO 948 form of the Official Draftsperson's Review, which was supplied to applicant with the last office action of October 17th 2005, the official draftsperson has objected to the drawings submitted on December 2nd 2003.

10. A New set of corrected drawings is required in this application because the official draftsperson has objected to the drawings submitted **December 2nd 2003**. A **complete set of NEW FORMAL DRAWINGS** including any and all examiner approved drawing changes, that have occurred during this examination are now required.

11. Applicant is advised to employ the services of a competent patent draftsperson outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Response to Arguments

12. Applicant's arguments, with respect to **Amended claims 1-19** from the December 20th 2005 amendment, have been considered. The **after-final amendment of December 20th 2005** has been marked "**do not enter**" by the examiner because the claims presented therein still have antecedence/ intended use issues, concerning the

apparatus/system claims and some grammatical problems, which needed to be corrected by an examiner's amendment.

13. The examiner spoke to applicant on January 5th 2006 in a telephonic interview, in an attempt to resolve the remaining issues, and place the application in better condition for allowance. The applicant's representative attorney **Steven H. Noll Reg. No. 28, 982** gave the examiner permission to correct the noted issues by an examiner's amendment in order to move the application forward towards allowance. The examiner has amended all of the claims, which were amended in the after-final amendment of December 20th 2005, to include the amendments presented, as well as the other grammatical / antecedence / intended use issues, corrections needed, since the after-final amendment of December 20th 2005 has been marked "do not enter", for failing to resolve all of the remaining issues by itself.

14. No new matter has been entered by the examiner amendments above.

15. With respect to the applied prior art of **Yablonskiy** US Patent 6,603,989 B1 issued August 5th 2003, filed November 1st 2000, with an effective US priority date from US provisional application 60/190,994 of **March 21st 2000**, from the **October 17th 2005** office action, this reference is no longer being applied by the examiner, because upon further review of this reference, and applicant's arguments in the after-final amendment of December 20th 2005, the examiner agrees with applicant that the magnetic field strength determined by **Yablonskiy** is the main, static / homogeneous magnetic field, B₀ and not the temporarily applied RF emitted magnetic field pulse B₁ as set forth in applicant's examiner amended claims above. Therefore all of the rejections which rely on **Yablonskiy** are rescinded.

Prior art of Record

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

A) **Mills** International PCT publication WO 02/16956 A1 published February 28th 2002, which corresponds to the 79 pages of the United States **Mills** reference applied above as prior art. The examiner notes that this international publication is 170 pages in length. For the sake of brevity the shorter US Pre- Grant Publication was applied, but

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the same teachings are rejections can also be made with this international reference, which potentially qualifies as art 35 USC under 102 (b), and 35 USC 103 (a).

B) Kasuboski et al., US patent 5,345,175 issued September 6th 1994.

C) Feiweier US patent application publication 2004/0164737 A1 published August 26th 2004, filed December 3rd 2003, which corresponds to applicant's instant application, which is noted for the purposes of a complete record only. This reference is not available as prior art against the claims of the instant application.

D) *Frahm et al., US patent 4,707,658 issued November 17th 1987.

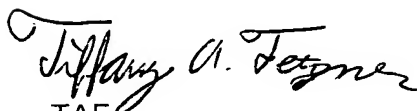
E) Yablonskiy US Patent 6,603,989 B1 issued August 5th 2003, filed November 1st 2000, with an effective US priority date from US provisional application 60/190,994 of **March 21st 2000**.

F) Mills US Patent Application Publication 2004/0027127 A1 published February 12th 2004, with an effective priority from an English 2001 US designating PCT with an international filing date of August 21st 2001, and an effective US priority date of **August 22nd 2000**.

Conclusion

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

18. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(571) 273-8300**.


TAF
January 9, 2006


for Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800